

Application No. 09/344,629

Please add Claim 30:

The apparatus according to claim 17, wherein the predetermined display characteristic includes transmittance, the control circuit changing the minimum transmittance in accordance with the light amount signal.

Please add Claim 31:

The apparatus according to claim 17, wherein the predetermined display characteristic includes contrast ratio, the control circuit changing the contrast ratio in accordance with the light amount signal.

REMARKS/ARGUMENTS

Pending Claims and Amendments to the Claims

Claims 30 and 31 have been added such that Claims 3 through 5, 7 through 12, 16 through 19, 22 through 26, and 30 through 31 are pending in the application. Claims 1, 2, 6, 14, 15, 20 and 21 have been cancelled. Claim 3 has been amended to include the limitations of Claims 1 and 2. Claim 7 has been amended to include the limitations of Claims 1 and 6. Claim 9 has been amended to include the limitations of Claim 1. Claims 16 and 17 have been amended to include the limitations of Claim 15. Claim 22 has been amended to include the limitations of Claims 20 and 21. Claims 23 through 25 have been amended to include the limitations of Claim 20.

Attached hereto is a marked up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version With Markings to Show Changes Made."

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Section 103 Rejection

The Helms and APA references

Applicants respectfully traverse the rejection of Claims 1 through 12 and 15 through 29 as being unpatentable over Applicants Admitted Prior Art ("APA") in view of U.S. Patent No. 5,952,922 ("Helms"). To establish a prima facie case of obviousness under 35 U.S.C. § 103(a), the Examiner must show that 1) the references teach all of the elements of the claimed invention, 2) the references contain some teaching, suggestion or motivation to combine the references, and 3) the references suggest a reasonable expectation of success. Because the references cited by the Examiner do not teach all of the elements of the claimed invention, the prima facie elements of an obviousness rejection under 35 U.S.C. § 103(a) are not met.

Helms is directed to an LCD brightness control system that includes a photodetector (14) for detecting ambient light and a brightness control circuitry (204) for controlling the brightness of the LCD panel (12). However, the Helms patent only discloses control circuitry to control brightness. The Helms reference does not disclose or teach control circuitry that will control other predetermined display characteristics such as transmittance as claimed in amended Claim 3, contrast ratio as claimed in amended Claim 7, and the opening and closing of a cover as claimed in amended Claim 9. Further, the Helms reference does not disclose a control circuit for controlling an ON/OFF of a light source, the opening and closing of the cover, and adjusts the contrast ratio in addition to controlling the brightness as claimed in amended Claims 22 through 26. The Examiner argues that the brightness is the predetermined display characteristic of the Helms reference. Applicants respectfully remind the Examiner that the predetermined characteristics defined in the claimed

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invention (as amended) do not include brightness. Thus, whether the Helms reference controls a predetermined characteristic is irrelevant since the Helms reference does not control any of the *claimed* predetermined characteristics.

Since the Helms reference does not teach all of the elements of the claimed invention, the APA reference must teach or disclose those elements which the Helms reference does not. The APA reference also does not teach or disclose control circuitry that will control other predetermined display characteristics such as transmittance as claimed in amended Claim 3, contrast ratio as claimed in amended Claim 7, and the opening and closing of a cover as claimed in amended Claim 9. Further, the APA reference does not disclose a control circuit for controlling an ON/OFF of a light source, the opening and closing of the cover, and adjusts the contrast ratio in addition to controlling the brightness as claimed in amended Claims 22 through 26. Thus, the combination of the Helms reference and the APA reference does not teach all of the elements of the claimed invention, as amended. Since the combination of these references do not teach all of the elements of the claimed invention, Applicants respectfully request that the Examiner withdraw the Section 103 rejection of Claims 3, 7 through 9 and 22 through 26.

As respects Claims 16 and 17, as amended, the Helms reference does not teach or disclose a light receiving device being formed on one of the facing surfaces of the first and second substrates in the peripheral area and arranged adjacent to the display area, as claimed in Claim 16. The Helms reference also does not teach a light receiving device arranged facing a luminescent unit on one of the substrates and located adjacent to the display area, as claimed in Claim 17. In order for the obviousness rejection to stand, the APA reference must teach the claimed elements missing from the

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Helms reference. However, the APA also does teach a light receiving device being formed on one of the facing surfaces of the first and second substrates in the peripheral area and arranged adjacent to the display area, as claimed in Claim 16. The APA reference also does not teach a light receiving device arranged facing a luminescent unit on one of the substrates and located adjacent to the display area, as claimed in Claim 17. Thus, the combination of the APA reference and the Helms reference does not disclose or teach all of the elements of the claimed invention. Applicants respectfully request that the Examiner withdraw the obviousness rejection of Claims 16 and 17.

The Helms, APA, and Koenck references

As Claim 14 was cancelled by the above amendment, Applicants submit that the Examiner's rejection of Claim 14 is now moot. In view of this, Applicants will not address the substance of the Examiner's rejection.

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Based upon the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

SHERIDAN ROSS P.C.

By: 

Mollybeth R. Kocialski

(Registration No. 42,754

1560 Broadway, Suite 1200

Denver, Colorado 80202-5141

(303) 863-9700

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

3. (Once amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel having a predetermined display characteristic;

a luminescent unit located adjacent to the liquid crystal display panel, wherein the luminescent unit includes a light collector, which collects ambient light, and a light source, wherein
5 the collected ambient light is used as a backlight of the liquid crystal display panel;

a light receiving device substantially countering the ambient light directed toward the light collector to detect the amount of ambient light collected by the light collector; and

a control circuit electrically connected to the liquid crystal display panel and the light receiving device, wherein the control circuit varies the predetermined display characteristic in
10 accordance with the amount of the detected ambient light, wherein the predetermined display characteristic includes transmittance, the control circuit changing a minimum transmittance in accordance with the amount of collected ambient light, and [The apparatus according to claim 2,]

wherein the liquid crystal display panel includes an electrode to which a voltage of a predetermined range is applied, wherein the control circuit shifts the predetermined voltage range in accordance
15 with the amount of collected ambient light to thereby change the minimum transmittance.

7. (Once Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel having a predetermined display characteristic;

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a luminescent unit located adjacent to the liquid crystal display panel, wherein the luminescent unit includes a light collector, which collects ambient light, and a light source, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

5 a light receiving device substantially countering the ambient light directed toward the light collector to detect the amount of ambient light collected by the light collector; and

a control circuit electrically connected to the liquid crystal display panel and the light receiving device, wherein the control circuit varies the predetermined display characteristic in accordance with the amount of the detected ambient light, wherein the predetermined display characteristic includes transmittance, the control circuit changing a minimum transmittance in
10 accordance with the amount of collected ambient light, and [The according to claim 6,] wherein the liquid crystal display panel includes an electrode to which a voltage of a predetermined range is applied, and wherein the control circuit narrows the predetermined voltage range in order to decrease the contrast ratio when the amount of collected ambient light is equal to or greater than a predetermined value.

8. (Once Amended) The apparatus according to claim [1] 9, wherein the control circuit is connected to the light source, the control circuit turning off the light source when the amount of collected ambient light is equal to or greater than a predetermined value and turning on the light source when the amount of collected ambient light is less than the predetermined value.

9. (Once Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel having a predetermined display characteristic;

a luminescent unit located adjacent to the liquid crystal display panel, wherein the luminescent unit includes a light collector, which collects ambient light, and a light source, wherein

the collected ambient light is used as a backlight of the liquid crystal display panel;

a light receiving device substantially countering the ambient light directed toward the light collector to detect the amount of ambient light collected by the light collector; and

a control circuit electrically connected to the liquid crystal display panel and the light receiving device, wherein the control circuit varies the predetermined display characteristic in accordance with the amount of the detected ambient light, wherein the predetermined display characteristic includes transmittance, the control circuit changing a minimum transmittance in accordance with the amount of collected ambient light, and [The apparatus according to claim 1],

wherein the luminescent unit includes a cover that moves between an open and closed position to selectively cover the light collector, and wherein the apparatus includes a cover driving apparatus connected to the control circuit to move the cover between the open and closed positions and the predetermined display characteristic includes opening and closing of the cover.

16. (Once Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel having a predetermined display characteristic;

a luminescent unit located adjacent to the liquid crystal display panel for providing light to the display panel to illuminate the display panel, wherein the luminescent unit includes a

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light collector, which collects ambient light, and a light source, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

a light receiving device substantially countering the ambient light directed toward the light collector to generate a light amount signal corresponding to the amount of ambient light collected by the light collector; and

a control circuit electrically connected to the liquid crystal display panel and the light receiving device, wherein the control circuit varies the predetermined display characteristic in accordance with the light amount signal, and [The apparatus according to claim 15], wherein the liquid crystal display panel includes:

first and second substrates;

a liquid crystal layer arranged between the first and second substrates; and

a sealed portion for sealing the liquid crystal layer and defining a peripheral area and a display area of the liquid crystal display panel, wherein the light receiving device is formed on one of the facing surfaces of the first and second substrates in the peripheral area and is arranged adjacent to the display area.

17. (Once Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel having a predetermined display characteristic;

a luminescent unit located adjacent to the liquid crystal display panel for providing light to the display panel to illuminate the display panel, wherein the luminescent unit includes a

light collector, which collects ambient light, and a light source, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

a light receiving device substantially countering the ambient light directed toward the light collector to generate a light amount signal corresponding to the amount of ambient light collected by the light collector; and

a control circuit electrically connected to the liquid crystal display panel and the light receiving device, wherein the control circuit varies the predetermined display characteristic in accordance with the light amount signal, and [The apparatus according to claim 15], wherein the liquid crystal display panel includes a pair of substrates, and wherein the light receiving device is arranged facing the luminescent unit on one of the substrates and adjacent to a display area of the liquid crystal display panel.

18. (Once Amended) The apparatus according to claim [15] 16, wherein the predetermined display characteristic includes transmittance, the control circuit changing the minimum transmittance, in accordance with the light amount signal.

19. (Once Amended) The apparatus according to claim [15] 16, wherein the predetermined display characteristic includes contrast ratio, the control circuit changing the contrast ratio in accordance with the light amount signal.

22. (Once Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel for displaying an image having a predetermined contrast ratio and brightness;

a luminescent unit arranged adjacent to the liquid crystal display panel, wherein the luminescent unit includes a light collector, which collects ambient light, a light source, and a cover, which opens and closes to selectively cover the light collector, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

a cover driving apparatus for opening and closing the cover;

a light receiving device substantially countering the ambient light directed toward the light collector to generate a light receiving signal corresponding to the amount of ambient light collected by the light collector; and

a control circuit connected to the liquid crystal display panel, the light receiving device, the light source, and the cover driving apparatus, wherein the control circuit controls an ON/OFF of the light source, the opening and closing of the cover, and adjusts the contrast ratio and the brightness in accordance with the light receiving signal, wherein the control circuit includes:

a judgment circuit for generating at least one of a contrast ratio adjustment signal, a brightness adjustment signal, a cover driving signal and an ON/OFF signal in accordance with the light receiving signal;

a contrast ratio adjustment circuit connected to the judgment circuit, the contrast ratio adjustment circuit processing an image signal to adjust the contrast ratio in accordance with the contrast ratio adjustment signal; and

a brightness adjustment circuit connected to the contrast ratio adjustment circuit and the liquid crystal display panel, the brightness adjustment circuit processing the image signal, which contrast ratio has been adjusted, to adjust the brightness in accordance with the brightness adjustment signal, and [The apparatus according to claim 21,] wherein the judgment

5 circuit includes:

a first judgment circuit for receiving the light receiving signal from the light receiving device and comparing the light receiving signal with a first criterion value to generate a contrast ratio adjustment signal;

10 a second judgment circuit for receiving the light receiving signal from the light receiving device and comparing the light receiving signal with a second criterion value to generate a brightness adjustment signal;

a third judgment circuit connected to the cover driving apparatus, the third judgment circuit receiving the light receiving signal from the light receiving device and comparing the light receiving with a third criterion value to generate a cover driving signal; and

15 a fourth judgment circuit connected to the light source, the fourth judgment circuit receiving the light receiving signal from the light receiving device and comparing the light receiving signal with a fourth criterion value to generate an ON/OFF signal.

23. (Twice Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel for displaying an image having a predetermined contrast ratio and brightness;

a luminescent unit arranged adjacent to the liquid crystal display panel, wherein the luminescent unit includes a light collector, which collects ambient light, a light source, and a cover, which opens and closes to selectively cover the light collector, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

5 a cover driving apparatus for opening and closing the cover;

a light receiving device substantially countering the ambient light directed toward the light collector to generate a light receiving signal corresponding to the amount of ambient light collected by the light collector; and

10 a control circuit connected to the liquid crystal display panel, the light receiving device, the light source, and the cover driving apparatus, wherein the control circuit controls an ON/OFF of the light source, the opening and closing of the cover, and adjusts the contrast ratio and the brightness in accordance with the light receiving signal, [The apparatus according to claim 20,]
wherein the control circuit includes:

15 a linear contrast ratio adjustment circuit for receiving the light receiving signal and processing an image signal to adjust the contrast ratio in a linear manner in accordance with the light receiving signal;

20 a linear brightness adjustment circuit connected to the linear contrast ratio adjustment circuit and the liquid crystal display panel, the linear brightness adjustment circuit receiving the light receiving signal from the light receiving device and processing the image signal, which contrast ratio has been adjusted, to adjust the brightness in a linear manner in accordance with the light receiving signal;

a first judgment circuit connected to the cover driving apparatus, the first judgment circuit receiving the light receiving signal from the light receiving device and comparing the light receiving signal with a first criterion value to generate a cover driving signal; and

a second judgment circuit connected to the light source, the second judgment circuit receiving the light receiving signal from the light receiving device and comparing the light receiving signal with a second criterion value to generate an ON/OFF signal.

24. (Once Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel for displaying an image having a predetermined contrast ratio and brightness;

a luminescent unit arranged adjacent to the liquid crystal display panel, wherein the luminescent unit includes a light collector, which collects ambient light, a light source, and a cover, which opens and closes to selectively cover the light collector, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

a cover driving apparatus for opening and closing the cover;

a light receiving device substantially countering the ambient light directed toward the light collector to generate a light receiving signal corresponding to the amount of ambient light collected by the light collector; and

a control circuit connected to the liquid crystal display panel, the light receiving device, the light source, and the cover driving apparatus, wherein the control circuit controls an ON/OFF of the light source, the opening and closing of the cover, and adjusts the contrast ratio and

the brightness in accordance with the light receiving signal. [The apparatus according to claim 20,]

wherein the control circuit includes:

an analog-to-digital converter connected to the light receiving device to convert the light receiving signal to a digital light receiving signal;

5 a judgment circuit connected to the analog-to-digital converter, the cover drive apparatus, and the light source, wherein the judgment circuit compares the digital light receiving signal with a first criterion value to generate a contrast ratio adjustment signal, compares the digital light receiving signal with a second criterion value to generate a brightness adjustment signal, compares the digital light receiving signal with a third criterion value to generate a cover driving
10 signal, and compares the digital light receiving signal with a fourth criterion value to generate an ON/OFF signal;

a multiplier connected to the judgment circuit to multiply a digital image signal with the contrast ratio adjustment signal to adjust the contrast ratio thereof;

an adder-subtractor connected to the multiplier and the judgment circuit to perform
15 summation and subtraction on the digital image signal, which contrast ratio has been adjusted, with the brightness adjustment signal to adjust the brightness;

a digital signal processing circuit connected to the adder-subtractor to perform a predetermined digital signal process on the digital image signal, which contrast ratio and brightness have been adjusted; and

a digital-to-analog converter connected between the digital signal processing circuit and the liquid crystal display panel to convert the processed digital image signal to an analog image signal.

25. (Once Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel for displaying an image having a predetermined contrast ratio and brightness;

a luminescent unit arranged adjacent to the liquid crystal display panel, wherein the luminescent unit includes a light collector, which collects ambient light, a light source, and a cover, which opens and closes to selectively cover the light collector, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

a cover driving apparatus for opening and closing the cover;

a light receiving device substantially countering the ambient light directed toward the light collector to generate a light receiving signal corresponding to the amount of ambient light collected by the light collector; and

a control circuit connected to the liquid crystal display panel, the light receiving device, the light source, and the cover driving apparatus, wherein the control circuit controls an ON/OFF of the light source, the opening and closing of the cover, and adjusts the contrast ratio and the brightness in accordance with the light receiving signal, [The apparatus according to claim 20,]

wherein the control circuit includes:

an analog-to-digital converter connected to the light receiving device to convert the light receiving signal to digital light receiving signal;

a multiplier connected to the analog-to-digital converter to multiply the digital image signal with the digital light receiving signal to adjust the contrast ratio thereof;

5 an adder-subtractor connected to the multiplier and the analog-to-digital converter to perform summation and subtraction on the digital image signal, which contrast ratio has been adjusted, with the digital light receiving signal to adjust the brightness; and

a judgment circuit connected to the analog-to-digital converter, the cover driving apparatus, and the light source, wherein the judgment circuit compares the digital light receiving
10 signal with a first criterion value to generate a cover driving signal and compares the digital light receiving signal with a second criterion value to generate an ON/OFF signal.

26. (Twice Amended) A liquid crystal display apparatus comprising:

a liquid crystal display panel for displaying an image having a predetermined contrast ratio and brightness;

a luminescent unit arranged adjacent to the liquid crystal display panel, wherein the
5 luminescent unit includes a light collector, which collects ambient light, a light source, and a cover, which opens and closes too selectively cover the light collector, wherein the collected ambient light is used as a backlight of the liquid crystal display panel;

a cover driving apparatus for opening and closing the cover;

a first light receiving device substantially countering the ambient light directed toward the light collector to generate a first light receiving signal corresponding to amount of ambient light collected by the light collector;

5 a second light receiving device for generating a second light receiving signal corresponding to a total amount of light illuminating the liquid crystal panel, which includes the ambient light and the light of the light source; and

10 a control circuit connected to the liquid crystal display panel, the first and second light receiving devices, the light source, and the cover driving apparatus, wherein the control circuit controls an ON/OFF of the light source and the opening and closing of the cover in accordance with the first light receiving signal, and adjusts the contrast ratio and the brightness in accordance with the second light receiving signal.

30. (New) The apparatus according to claim 17, wherein the predetermined display characteristic includes transmittance, the control circuit changing the minimum transmittance in accordance with the light amount signal.

31. (New) The apparatus according to claim 17, wherein the predetermined display characteristic includes contrast ratio, the control circuit changing the contrast ratio in accordance with the light amount signal.